Chapter 11 Study Guide and Review

Vocabulary and Concept Check

apothem (p. 610)	irregular figure (p. 617)	sector (p. 623)
geometric probability (p. 622)	irregular polygon (p. 618)	segment (p. 624)

A complete list of postulates and theorems can be found on pages R1–R8.

Exercises Choose the formula to find the area of each shaded figure.

1. c   2. e   3. a

4. f   5. b   6. d

a. $A = \pi r^2$
b. $A = \dfrac{N}{360}$
c. $A = \frac{1}{2}bh$
d. $A = \frac{1}{2}d_1$
e. $A = bh$
f. $A = \frac{1}{2}h$

Lesson-by-Lesson Review
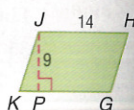
11-1 Area of Parallelograms
See pages 595–600.

Concept Summary
- The area of a parallelogram is the product of the base and the height.

Example Find the area of $\square GHJK$.

The area of a parallelogram is given by the formula $A = bh$.

$A = bh$ Area of a parallelogram
$= 14(9)$ or 126 $b = 14, h = 9$

The area of the parallelogram is 126 square units.

Exercises Find the perimeter and area of each parallelogram. *See Example 1 on page 596.*

7. **78 ft, ≈ 318.7 ft²**   16 ft, 60°, 23 ft

8. **116 mm, 396 mm²**   36 mm, 30°, 22 mm

COORDINATE GEOMETRY Given the coordinates of the vertices of a quadrilateral, determine whether it is a *square*, a *rectangle*, or a *parallelogram*. Then find the area of the quadrilateral. *See Example 3 on page 597.*

9. $A(-6, 1), B(1, 1), C(1, -6), D(-6, -6)$ **square; 49 units²**
10. $E(7, -2), F(1, -2), G(2, 2), H(8, 2)$ **parallelogram; 24 units²**
11. $J(-1, -4), K(-5, 0), L(-5, 5), M(-1, 1)$ **parallelogram; 20 units²**
12. $P(-7, -1), Q(-3, 3), R(-1, 1), S(-5, -3)$ **rectangle; 16 units²**

www.geometryonline.com/vocabulary_review

11-2 Areas of Triangles, Rhombi, and Trapezoids
See pages 601–609.

Concept Summary
- The formula for the area of a triangle can be used to find the areas of many different figures.
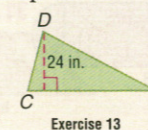- Congruent figures have equal areas.

Example Trapezoid MNPQ has an area of 360 square feet. Find the length of $\overline{MN}$.

$A = \frac{1}{2}h(b_1 + b_2)$ Area of a trapezoid
$360 = \frac{1}{2}(18)(b_1 + 26)$ $A = 360, h = 18, b_2 = 26$
$360 = 9b_1 + 234$ Multiply.
$14 = b_1$ Solve for b_1.

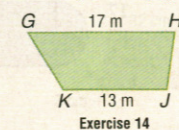The length of $\overline{MN}$ is 14 feet.

MN, 18 ft, Q, 26 ft, P

Exercises Find the missing measure for each quadrilateral. *See Example 4 on page 604.*

13. Triangle CDE has an area of 336 square inches. Find CE. **28 in.**
14. Trapezoid GHJK has an area of 75 square meters. Find the height. **5 m**

D, 24 in., C, E — Exercise 13
G, 17 m, H, K, 13 m, J — Exercise 14

11-3 Areas of Regular Polygons and Circles
See pages 610–616.

Concept Summary
- A regular n-gon is made up of n congruent isosceles triangles.
- The area of a circle of radius r units is πr^2 square units.

Example Find the area of a regular hexagon with a perimeter of 72 feet.

Since the perimeter is 72 feet, the measure of each side is 12 feet. The central angle of a hexagon is 60°. Use the properties of 30°-60°-90° triangles to find that the apothem is $6\sqrt{3}$ feet.

$A = \frac{1}{2}Pa$ Area of a regular polygon
$= \frac{1}{2}(72)(6\sqrt{3})$ $P = 72, a = 6\sqrt{3}$
$= 216\sqrt{3}$ Simplify.
≈ 374.1

12 ft, a, 12 ft, 60°, 6 ft, 12 ft
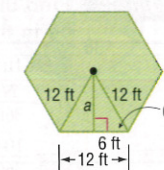
The area of the regular hexagon is 374.1 square feet to the nearest tenth.

Exercises Find the area of each polygon. Round to the nearest tenth. *See Example 1 on page 611.*

15. a regular pentagon with perimeter of 100 inches **688.2 in²**
16. a regular decagon with side length of 12 millimeters **1108.0 mm²**

11-4 Areas of Irregular Figures

See pages 617–621.

Concept Summary

• The area of an irregular figure is the sum of the areas of its nonoverlapping parts.

Example Find the area of the figure.

Separate the figure into a rectangle and a triangle.

$$\begin{array}{ccc} \text{area of} \\ \text{irregular figure} \end{array} = \begin{array}{c} \text{area of} \\ \text{rectangle} \end{array} - \begin{array}{c} \text{area of} \\ \text{semicircle} \end{array} + \begin{array}{c} \text{area of} \\ \text{triangle} \end{array}$$

$$= \ell w - \tfrac{1}{2}\pi r^2 + \tfrac{1}{2}bh \qquad \text{Area formulas}$$

$$= (6)(8) - \tfrac{1}{2}\pi(4^2) + \tfrac{1}{2}(8)(8) \qquad \text{Substitution}$$

$$= 48 - 8\pi + 32 \text{ or about } 54.9 \qquad \text{Simplify.}$$
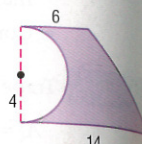
The area of the irregular figure is 54.9 square units to the nearest tenth.

Exercises Find the area of each figure to the nearest tenth. *See Example 1 on page 617.*

17. **31.1 units²**

18. **87.5 units²**

11-5 Geometric Probability
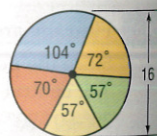
See pages 622–627.

Concept Summary

• To find a geometric probability, divide the area of a part of a figure by the total area.

Example Find the probability that a point chosen at random will be in the blue sector.

First find the area of the blue sector.

$$A = \frac{N}{360}\pi r^2 \qquad \text{Area of a sector}$$

$$= \frac{104}{360}\pi(8^2) \text{ or about } 58.08 \qquad \text{Substitute and simplify.}$$

To find the probability, divide the area of the sector by the area of the circle.

$$P(\text{blue}) = \frac{\text{area of sector}}{\text{area of circle}} \qquad \text{Geometric probability formula}$$

$$= \frac{58.08}{\pi 8^2} \text{ or about } 0.29 \qquad \text{The probability is about 0.29 or 29\%.}$$

Exercises Find the probability that a point chosen at random will be in the sector of the given color. *See Example 2 on page 623.*

19. red **0.3**

20. purple or green **≈0.27**
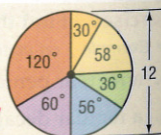
Chapter 11 Practice Test

Vocabulary and Concepts

Choose the letter of the correct area formula for each figure.

1. regular polygon **a**
2. trapezoid **c**
3. triangle **b**

a. $A = \tfrac{1}{2}Pa$

b. $A = \tfrac{1}{2}bh$

c. $A = \tfrac{1}{2}h(b_1 + b_2)$

Skills and Applications

COORDINATE GEOMETRY Given the coordinates of the vertices of a quadrilateral, determine whether it is a *square*, a *rectangle*, or a *parallelogram*. Then find the area of the quadrilateral.

4. $R(-6, 8), S(-1, 5), T(-1, 1), U(-6, 4)$ **parallelogram, 20 units²**

5. $R(7, -1), S(9, 3), T(5, 5), U(3, 1)$ **square, 20 units²**

6. $R(2, 0), S(4, 5), T(7, 5), U(5, 0)$ **parallelogram, 15 units²**

7. $R(3, -6), S(9, 3), T(12, 1), U(6, -8)$ **rectangle, 39 units²**

Find the area of each figure. Round to the nearest tenth if necessary.

8. **261 m²**

9. **855 yd²**

10. **814 cm²**

11. a regular octagon with apothem length of 3 ft **29.8 ft²**

12. a regular pentagon with a perimeter of 115 cm **910.1 cm²**

Each spinner has a diameter of 12 inches. Find the probability of spinning the indicated color.

13. red **0.28**

14. orange **0.24**

15. green **0.38**
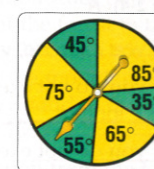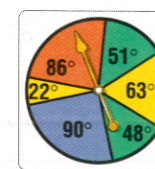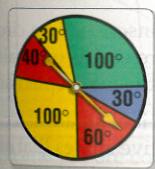
Find the area of each figure. Round to the nearest tenth.

16. **474 units²**

17. **91.2 units²**

18. **87.5 units²**

19. **SOCCER BALLS** The surface of a soccer ball is made of a pattern of regular pentagons and hexagons. If each hexagon on a soccer ball has a perimeter of 9 inches, what is the area of a hexagon? **5.8 in²**

20. **STANDARDIZED TEST PRACTICE** What is the area of a quadrilateral with vertices at $(-3, -1), (-1, 4), (7, 4),$ and $(5, -1)$? **D**

Ⓐ 50 units² Ⓑ 45 units² Ⓒ $8\sqrt{29}$ units² Ⓓ 40 units²

Portfolio Suggestion

Introduction Areas of irregular figures are used in architecture.

Ask Students Ask students to design the floor plan of an elaborate house or garden. Challenge them to include rooms of many different shapes. Have them find the area of each room, showing their calculations. Have students add their designs and area calculations to their portfolios.

Chapter 11 Practice Test

Assessment Options

Vocabulary Test A vocabulary test/review for Chapter 11 can be found on p. 654 of the *Chapter 11 Resource Masters.*

Chapter Tests There are six Chapter 11 Tests and an Open-Ended Assessment task available in the *Chapter 11 Resource Masters.*

Chapter 11 Tests			
Form	Type	Level	Pages
1	MC	basic	641–642
2A	MC	average	643–644
2B	MC	average	645–646
2C	FR	average	647–648
2D	FR	average	649–650
3	FR	advanced	651–652

MC = multiple-choice questions
FR = free-response questions

Open-Ended Assessment Performance tasks for Chapter 11 can be found on p. 653 of the *Chapter 11 Resource Masters.* A sample scoring rubric for these tasks appears on p. A22.
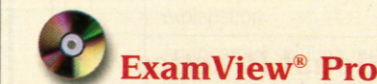
ExamView® Pro

Use the networkable ExamView® Pro to:

• Create **multiple versions** of tests.

• Create **modified** tests for Inclusion students.

• **Edit** existing questions and **add** your own questions.

• Use built-in **state curriculum correlations** to create tests aligned with state standards.

• **Apply** art to your tests from a program bank of artwork.